

# **OPTICAL MECHANISM FOR INCREASING OPTICAL PATH AND OFFICE MACHINE HAVING SAID OPTICAL MECHANISM**

## **5 BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

The present invention relates generally to an optical mechanism for use in an office machine, for example, a copy machine or scanner and, more particularly, to such an optical mechanism that increases the optical path of  
10 the office machine.

### **2. Description of the Related Art**

A paper-feeding type office machine, for example, a copy machine or scanner, as shown in FIG. 1, generally comprises a paper-feeding mechanism 10 which comprises a sheet-transferring mechanism 12, which is  
15 adapted to transfer paper 11, and a machine base 20, which is disposed on the bottom side of the paper-feeding mechanism 10. The machine base 20 comprises a document carrier glass 22, which is disposed on the top side, an optical-path device 30m which is disposed on the inside. Document carrier glass 22 has a scanning zone 25 near one side. The optical-path device 30, for  
20 example, a charge-coupled device, comprises an image sensor 32, which is adapted to convert a light signal into an electric signal that is further proceeded with and is stored by an electronic device, and an optical module 34, which comprises a light source that provides a scanning light to the scanning zone 25 for scanning a document, and which comprises a lens set

adapted to focus reflected light onto the image sensor 32. The paper-feeding mechanism 10 has a scanning hole 17 in the bottom panel 16 for enabling paper 11 to be transferred to the scanning zone 25 and then back to the topside of the paper-feeding mechanism 10. Another design is possible, in which  
5 document is delivered sideways from the surface of the document carrier glass 22.

According to this design of office machine, paper 11 must be kept in close contact with the scanning zone 25 to match the focus 36 of the optical-path device 30. This close contact makes the structural design difficult,  
10 and does not allow the paper-feeding mechanism 10 to have much internal space for holding component parts of the machine. Further, because the sheet-transferring mechanism 12 must be kept as close to the bottom panel 16 as possible, the design of the arrangement of the internal component parts in the sheet-transferring mechanism 12 is complicated and difficult.

15 Therefore, it is desirable to provide an optical mechanism for use in an office machine, which increases the optical path to facilitate the arrangement of internal component parts.

### **SUMMARY OF THE INVENTION**

The present invention has been accomplished under the  
20 circumstances in view. It is the main object of the present invention to provide an optical mechanism for use in an office machine, which increases the optical path to provide a large amount of space for a document-transferring mechanism to facilitate the arrangement of internal component parts. It is another object of the present invention to provide an optical mechanism

which improves document transferring path to stabilize the scanning quality of the office machine, making image pick-up more accurate and clearer.

The optical mechanism is installed in an office machine, which has a machine base defining an internal space, and a paper-feeding mechanism arranged on the machine base. The paper-feeding mechanism has an inside receiving space, and a bottom incident zone for the passing of light. The optical mechanism comprises an optical-path device, which is formed of an image sensor and an optical module and mounted in the internal space inside the machine base, and a light-focusing structure mounted in the receiving space inside the paper-feeding mechanism above the incident zone for increasing optical path.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a schematic drawing of a paper-feeding type office machine according to the prior art;

FIG. 2 is a schematic drawing of an optical mechanism for increasing optical path according to the present invention;

FIG. 3 is a schematic drawing of an office machine constructed according to the present invention;

FIG. 4 shows a first example of the light-focusing structure for the optical mechanism according to the present invention;

FIG. 5 shows a second example of the light-focusing structure for the optical mechanism according to the present invention; and

FIG. 6 shows a third example of the light-focusing structure for the optical mechanism according to the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 2, an optical mechanism for increasing optical path in accordance with the present invention is shown, which comprises an optical-path device 60 and a light-focusing structure 65. The optical-path device 60 comprises an image sensor 62 and an optical module 63 for providing a scanning light. The light-focusing structure 65 is set in the optical path between the optical module 63 of the optical-path device 60 and the document to be scanned. The scanning light of the optical-path device 60 is focused and thus, forms a front focus 64. The light which passes through the front focus 64, and thus is dispersed, is focused on again and thus, forms a rear focus 66 through using the light-focusing structure 65. The rear focus 66 is the position for the document to be scanned. By means of the aforesaid arrangement, an optical path  $h$  between the front focus 64 and the rear focus 66 is added to the space that accommodates a document conveyer. In FIG. 2, a lens is used to indicate the light-focusing structure 65. In actual practice, the light-focusing structure 65 can be comprised of at least one convex lens, or any of a variety of light-focusing means to focus the dispersed light which passes through the front focus, onto the rear focus 66.

FIG. 3 shows an office machine constructed according to the present invention, in which the office machine can be a copy machine or scanner comprising a paper-feeding mechanism 40, and a machine base 50 supporting the paper-feeding mechanism 40. The paper-feeding mechanism 40 defines therein a receiving space. The machine base 50 has an internal space on the bottom side thereof. The paper-feeding mechanism 40 comprises a

sheet-transferring mechanism **42** which is adapted to transfer the document to be scanned **41**, a bottom panel **45** which defines an incident zone **46**, and a light-focusing structure **65** which is mounted in the receiving space inside the paper-feeding mechanism **40** and is set above the incident zone **46**. The  
5 incident zone **46** can be a transparent material, or an opening for letting the scanning light pass therein. The machine base **50** comprises a document carrier glass **52** defining a scanning zone **55**, and the optical-path device **60** mounted on the inside. The optical-path device **60** comprises an image sensor **62** and an optical module **63**. The light-focusing structure **65** is set in the  
10 optical path between the optical module **63** of the optical-path device **60** and the document to be scanned **41**.

The light which passes through the optical-path device **60** is focused onto the front focus **64** on the surface **53** of the document carrier glass **52**. The light-focusing structure **65** is disposed between the front focus **64** of the  
15 optical-path device **60** and the document to be scanned **41**, and focuses the dispersed light which passes through the front focus **64**, onto the rear focus **66**. The rear focus **66** is the scanning position of the document **41** to be scanned. The sheet-transferring mechanism **42** is disposed in proximity to the rear focus **66**. The present invention increases the total optical path using the  
20 light-focusing structure. The extended optical path facilitates accurate arrangement of related component parts of the machine. The sheet-transferring mechanism **42** can be comprised of one single pair of transferring wheels **43** and **44** arranged in parallel on two sides of the rear focus **66** without any means to impress the document. After being scanned,

the document **41** is sent onto the top side of the paper-feeding mechanism **40**. Alternatively, the document can be sent out of one side of the top surface **53** of the document carrier glass **52** after being scanned. These different document-transferring structures are obvious to any person skilled in the art.

5 No further detailed description or drawing thereof is necessary.

FIG. 4 shows an example of the light-focusing structure. According to this design, the incident zone **46** of the paper-feeding mechanism **40** is formed of transparent material. The light-focusing structure **70** comprises an extension portion **74** formed integral with and upwardly extended from the

10 incident zone **46** of the paper-feeding mechanism **40**, and a protruding portion **72** is provided on the top side of the extension portion **74**.

FIGS. 5 and 6 show another two different examples of the light-focusing structure. As illustrated, the incident zone **46** of the paper-feeding mechanism **40** is an opening. The light-focusing structure **65**

15 comprises a hollow locating device **74**, which is disposed on two sides of the incident zone **46** and which is upwardly extended from the bottom panel **45** of the paper-feeding mechanism **40**, and a condensing lens set **61**, which is formed of at least one convex lens and fastened or adhered to the locating device **74**. The condensing lens set **61** comprises a mounting groove **68**,

20 which is adapted to receive the flanged top side of the locating device **74** (see FIG. 5), or two mounting flanges **69**, which are positioned on the top side of the locating device **74** (see FIG. 6). The condensing lens set **61** can be molded of plastics by a precision injection-molding machine.

As indicated above, the optical mechanism of the present invention

increases the optical path by a distance  $h$ , which makes arrangements and designs of image pick-up means and of the scanning position easier and more precise.

Although particular embodiments of the invention have been  
5 described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.